

composite unit, in which a slit-shaped gas channel (7) formed by the first electrode face (4.1) facing away from the membrane electrolyte (6) and the first housing part (2.1) and through which a vapor-saturated, ion-generating carrier gas (G,V) along with the vapor component flows;

a slit-shaped liquid channel (8) formed by the second electrode face (5.1) facing away from the membrane electrolyte (6) and the second housing part (2.2) through which a vapor-absorbing solution (S) flows;

wherein the electrodes (4), (5) are connected with current lead-in and lead-off systems (9), (10) and an external load resistor (11);

feeding vapor-enriched carrier gas (G,V)₄, (ZP₄) with a high/first vapor partial pressure (P_r, P_{v4}) to the gas channel (7) via an inlet opening (12.1) in the first housing part (2.1), and carrying off a stoichiometric reduced quantity of vapor-depleted carrier gas (G,V)₁, (ZP₁) with a reduced/second vapor partial pressure (P_r, P_{v1}) off via an outlet opening (12.2), said first vapor partial pressure in the carrier gas being greater than said second vapor partial pressure;

feeding an undersaturated, depleted solution (S)₂, (ZP₂) with a low vapor component concentration (ξ_{s2}) and a low vapor component partial pressure (P_r, P_{v2}) to the liquid

channel (8) via an inlet opening (13.1) in the second housing part (2.2), and carrying off a two phase mixture (S,G,V)₃, (ZP3) of undersaturated enriched solution (S)₃ with a high vapor component concentration (ξ_{s3}) and a medium vapor partial pressure (P_t, P_{v3}) and a recovered, moderately vapor enriched carrier gas (G,V)₃ with the same medium vapor partial pressure (P_t, P_{v3}) via an outlet opening (13.2), so that when a cation-generating carrier gas with a vapor component is used and a membrane electrolyte (6) selectively admits said cations, cations are formed at the phase boundary (4.2) which is a gas/solid/electrolyte surface of the first electrode (4) as a result of anodic oxidation with the stoichiometric consumption of carrier gas and vapor from the gas channel (7);

said cations migrate through the membrane electrolyte (6) to the second electrode (5) and, at its phase boundary (5.1), which is a gas/liquid/solid surface, as a result of cathodic reduction with the recovery of an equivalent stoichiometric quantity of carrier gas in the solution, the concentration (ξ_s) of the absorbing solution flowing through the liquid channel (8) is increasing from ξ_{s2} to ξ_{s3} while the electrons from the first electrode (4) are flowing via the current conduction systems (9,10) and

the external load resistor (11) to the second electrode (5), or when an anion-generating carrier gas with a vapor component is used and a membrane electrolyte (6) selectively admits said anions, anions are formed at the phase boundary (4.2) which is a gas/solid/electrolyte surface on the first electrode (4) as a result of cathodic reduction with the stoichiometric consumption of carrier gas and vapor from the gas channel (7), said anions migrate through the membrane electrolyte (6) to the second electrode (5) and at its phase boundary (5.1), which is a gas/liquid/solid surface, as a result of anodic oxidation with the recovery of an equivalent stoichiometric quantity of carrier gas in the solution, the concentration (ξ_s) of the absorbing solution flowing through the liquid channel (8) is increasing from ξ_{s2} to ξ_{s3} while electrons from the second electrode (5) are flowing via the current conduction systems (9, 10) and the external load resistor (11) to the first electrode (4).

31. (New) A process for converting sorption reaction work into useful electrical work by means of a galvanic liquid electrolyte reaction cell (Fig.2) comprising feeding to and carrying off a substance system

consisting of a vapor/carrier gas mixture and a sorptive solution absorbing the vapor in the cell housing (21);

said cell housing (21) containing a flat-shaped, porous, gas-permeable first electrode (23) and a flat-shaped slit less second electrode (24), a media-sealing, electrically isolating peripheral seal (22) dividing said cell housing (21) into a first housing part (21.1) and a second housing part (21.2), the surfaces (23.2) of the first electrode (23) and the first housing part (21.1) facing one another form a slit-shaped gas channel (25) through which a vapor-saturated, ion-generating carrier gas (G,V) flows along with the vapor component;

the surface (23.1) of the first electrode (23) and the surface (24.1) of the second electrode (24) connecting slit less with the second cell housing part (21.2) facing one another forming a slit-shaped liquid channel (26) through which a vapor absorbing electrolytic solution (S) flows;

wherein the electrodes (23), (24) are connected with current lead-in and lead-off systems (27), (28) and an external load resistor (29);

feeding vapor-enriched carrier gas (G,V)₄, (ZP₄) with a high vapor partial pressure (P_T,P_{V4}) to the gas channel (25) via an inlet opening (30.1) in the first

housing part (21.1), and carrying off a stoichiometric reduced quantity of vapor-saturated carrier gas (G,V)₁ with a reduced vapor partial pressure (P_T,P_{V1}) via an outlet opening (30.2);

feeding an undersaturated, depleted solution (S)₂, (ZP₂) with a low vapor component concentration (ξ _{S2}) and a low vapor component partial pressure (P_T,P_{V2}) to the liquid channel (26) via an inlet opening (31.1) in the second housing part (21.2), and carrying off a two phase mixture (S,G,V)₃, (ZP₃) of undersaturated, enriched solution (S)₃ with a high vapor component concentration (ξ _{S3}) and a medium vapor partial pressure (P_T,P_{V3}) and a recovered, moderately enriched vapor carrier gas (G,V)₃ with the same medium vapor partial pressure (P_T,P_{V3}) via an outlet opening (31.2),

so, that when a cation-generating carrier gas with a vapor component is used, cations are formed at the phase boundary (23.1) which is a gas/liquid/solid surface of the first electrode (23) as a result of anodic oxidation with the stoichiometric consumption of carrier gas and vapor from the gas channel (25);

said cations migrate transversely through the solution flowing in the ion-conducting liquid gap (32) to the second electrode (24) and at its phase boundary (24.1),

which is a gas/liquid/solid surface, as a result of cathodic reduction with the stoichiometric recovery of an equivalent quantity of carrier gas in the solution, the vapor component concentration (ξ_s) in the absorbing solution flowing through the liquid channel (26) is increasing from ξ_{s2} to ξ_{s3} and the electrons from the first electrode (23) are flowing via the current conduction systems (27), (28) and the external load resistor (29) to the second electrode (24), or when an anion-generating carrier gas with a vapor component is used, anions are formed at the phase boundary (23.1) which is a gas/liquid/solid surface on the first electrode (23) as a result of cathodic reduction with the stoichiometric consumption of carrier gas and vapor from the gas channel (25), said anions migrate transversely through the solution flowing in the ion-conducting liquid gap (32) to the second electrode (24) and at its phase boundary (24.1), which is a gas/liquid/solid surface and as a result of anodic oxidation with the recovery of an equivalent stoichiometric quantity of carrier gas in the solution, the concentration (ξ_s) of the absorbing solution flowing through the liquid channel (26) is increasing from ξ_{s2} to ξ_{s3} and electrons from the second electrode (24) are

flowing via the current conduction systems (27, 28) and the external load resistor (29) to the first electrode (23).

32. (New) Process according to claim 30 wherein the substance phase quantities conveyed in the circuit by media-conveying devices (solution pump and gas compressor) are measured by the adjustable flow rates of the solution pump and the gas compressor so that in the galvanosorptive substance circuit the increase/decrease ($\xi_{s2} \rightarrow \xi_{s3}$ / $\xi_{s4} \rightarrow \xi_{s1}$, Fig.3), ($\xi_{s1} \rightarrow \xi_{s2}$ / $\xi_{s3} \rightarrow \xi_{s1}$, Fig.5) of the absorbed vapor component in the solution and the vapor enriching/depletion ($P_{vx} \rightarrow P_{v4}$ / $P_{v4} \rightarrow P_{v1}$, Fig.3), ($P_{vx} \rightarrow P_{v3}$ / $P_{v3} \rightarrow P_{v1}$, Fig.5) of the carrier gas are stabilized, whereby the overall system pressure (P_t) is adjusted by the carrier gas filling of the circuit and the carrier gas pressure is at the same level as, or greater than the highest vapor partial pressure reached in the ternary substance circulation.

33. (New) Process according to claim 30 wherein the galvanosorptive reaction process taking place in the reaction cell is running adiabatically or non-adiabatically, wherein in the case of non-adiabatic running of the process the electrode in contact with the solution

or its current conduction system has channels distributed uniformly over its area through which a heat transfer medium flows, the heat-transferring walls being medium-impermeable.

34. (New) Galvanosorptive reaction process according to claim 30 wherein any vapor-absorbing solution which is thermally decomposable into a vapor component and an absorbing liquid component, apart from the ion-generating and system pressure equalizing carrier gas, can be fed to and carried off from the reaction cell,

whereby hydrogen is the cation-generating carrier gas with the vapor component of the absorbing solution and oxygen is the anion-generating carrier gas and the substance system involved in the galvanosorptive reaction process, as a whole is at least a ternary one, whereby the structural materials of the reaction cell behave inertly with respect to the substance system selected.

35. (New) Process according to claim 33 wherein an activation voltage source assigned to the electrodes permanently delivers a voltage difference of a few volts and an, in comparison to the inherent current flow of the reaction cell, insignificant current flow, whereby this

voltage difference is superimposed on the inherent voltage difference of the cell.

36. (New) Process according to claim 32 wherein the substance flows fed to and carried off from the galvanic reaction cell (40) with external load resistor (41) are formed into an isobaric, ternary substance circuit with external thermal substance decomposition and external phase separation by allocation of a heated gas vapor enricher (42) that is combined with a first phase separator, a solution recuperator (43), a solution cooler (44), a second phase separator (45), a solution pump (46) and a gas compressor (47), (Fig.3, Fig.4);

whereby the two-phase mixture (S,G,V)₃ carried off from the liquid channel of the reaction cell (40) is fed to the second phase separator (45) and the phases (S)₃ and (G,V)₃ are separated, the vapor-depleted gas (G,V)₃ carried off at the head of the second phase separator (45) is united with the stoichiometric reduced vapor-depleted gas (G,V)₁ carried off from the gas channel of the reaction cell and the gas/vapor-mixture (G,V)_x is fed by the gas compressor (47) to the gas vapor enricher (42) combined with first phase separator, and in the gas vapor enricher is conveyed towards the heated vapor-depleting enriched

solution (S)4 with vapor uptake and the vapor-enriched gas (G,V)4 carried off at the head of the gas vapor enricher (42) that is combined with the first phase separator is fed again to the gas channel of the reaction cell (40);

while the vapor-enriched solution (S)3 carried off from the second phase separator (45) is conveyed by the solution pump (46) through the secondary side of the solution recuperator (43) and introduced at the head into the gas vapor enricher (42) that is combined with the first phase separator, and the vapor-depleted solution (S)1 is carried off at the bottom of the gas vapor enricher (42), passing through the primary side of the solution recuperator (43) and the solution cooler (44) and fed again to the liquid channel of the reaction cell (40).

37. (New) Process according to claim 35, wherein the substance flows fed to and carried off from the reaction cell (50) with external load resistor (56) and connected activation source (57) are formed into an isobaric, ternary substance circuit with the external thermal substance decomposition and external phase separation by the allocation of a heated solution heater (51), a gas vapor enricher (52) combined with a first phase

separator, a second phase separator (53), a solution pump (54) and a gas compressor (55), (Fig. 5, Fig. 6);

whereby the two-phase mixture (S,G,V)₂ carried off from the liquid channel of the reaction cell (50) is fed to the second phase separator (53) and the phases (S)₂ and (G,V)₂ are separated, the vapor-depleted gas (G,V)₂ carried off at the head of the second phase separator (53) is united with the stoichiometric reduced vapor-depleted gas (G,V)₁ carried off from the gas channel of the reaction cell and the gas vapor mixture (G,V)_x is fed by the gas compressor (55) to the gas vapor enricher (52) that is combined with a first phase separator and in the gas vapor enricher is conveyed towards the heated and vapor-depleting enriched solution (S)₃ with vapor uptake and the vapor-enriched gas (G,V)₃ carried off at the head of the gas vapor enricher (52) that is combined with a first phase separator, is fed again to the gas channel of the reaction cell (50), while the vapor-enriched solution (S)₂ carried off at the bottom of the phase separator (53) is conveyed by the solution pump (54) through the solution heater (51) and introduced at the head into the gas vapor enricher (52) that is combined with a first phase separator and the vapor-depleted solution (S)₁ carried off at the bottom of

the gas vapor enricher (52) is fed again to the liquid channel of the reaction cell (50).

38. (New) Process according to claim 31, wherein the substance phase quantities conveyed in the circuit by media-conveying devices (solution pump and gas compressor) are measured by the adjustable flow rates of the solution pump and the gas compressor so that in the galvanosorptive substance circuit the increase/decrease ($\xi_{s2} \rightarrow \xi_{s3} / \xi_{s4} \rightarrow \xi_{s1}$, Fig.3), ($\xi_{s1} \rightarrow \xi_{s2} / \xi_{s3} \rightarrow \xi_{s1}$, Fig.5) of the absorbed vapor component in the solution and the vapor enriching/depletion ($P_{VX} \rightarrow P_{V4} / P_{V4} \rightarrow P_{V1}$, Fig.3), ($P_{VX} \rightarrow P_{V3} / P_{V3} \rightarrow P_{V1}$, Fig.5) of the carrier gas are stabilized, whereby the overall system pressure (P_T) is adjusted by the carrier gas filling of the circuit and the carrier gas pressure is at the same level as or greater than the highest vapor partial pressure reached in the ternary substance circulation.

39. (New) Process according to claim 31, wherein the galvanosorptive reaction process taking place in the reaction cell is running adiabatically or non-adiabatically, wherein in the case of non-adiabatic running of the process the electrode in contact with the solution

or its current conduction system has channels distributed uniformly over its area through which a heat transfer medium flows, the heat-transferring walls being medium-impermeable.

40. (New) Galvanosorptive reaction process according to claim 31, wherein any vapor-absorbing solution which is thermally decomposable into a vapor component and a liquid component, apart from the ion-generating and system pressure equalizing carrier gas can be fed to and carried off from the reaction cell;

whereby hydrogen is the cation-generating carrier gas with the vapor component of the absorbing solution and oxygen is the anion-generating carrier gas with the vapor component and the substance system involved in the galvanosorptive reaction process as a whole is at least a ternary one and the structural materials of the reaction cell behave inertly with respect to the substance system selected.

41. (New) The process according to claim 40 wherein an electrolytic component with an, in comparison to the partial pressure of the vapor component, insignificant inherent vapor pressure soluble in the liquid component of

the solution which increases the ion conductivity and thereof, is added to the ternary substance system.

42. (New) Process according to claim 39 wherein an activation voltage source assigned to the electrodes permanently delivers a voltage difference of a few volts with an, in comparison to the inherent current flow of the reaction cell, insignificant current flow, whereby this voltage difference is superimposed on the inherent voltage difference of the cell.

43. (New) Process according to claim 38 wherein the substance flows fed to and carried off from the galvanic reaction cell (40) with external load resistor (41) are formed into an isobaric, ternary substance circuit with external thermal substance decomposition and external phase separation by the allocation of a heated gas vapor enricher (42) that is combined with a first phase separator, a solution recuperator (43), a solution cooler (44), a second phase separator (45), a solution pump (46), and a gas compressor (47), (Fig.3, Fig.4);

whereby the two-phase mixture (S,G,V)₃ carried off from the liquid channel of the reaction cell (40) is fed to the second phase separator (45) to separate phases (S)₃ and

(G,V)₃ and the vapor-depleted gas (G,V)₃ carried off at the head of the second phase separator (45) is united with the stoichiometric reduced vapor-depleted gas (G,V)₁ carried off from the gas channel of the reaction cell and the gas/vapor-mixture (G,V)_x is fed by the gas compressor (47) to the gas vapor enricher (42) that is combined with the first phase separator and in the gas vapor enricher is conveyed towards the heated vapor-depleting enriched solution (S)₄ with vapor uptake and the vapor-enriched gas (G,V)₄ carried off at the head of the gas vapor enricher (42) that is combined with the first phase separator is fed again to the gas channel of the reaction cell (40);

while the vapor-enriched solution (S)₄ carried off from the second phase separator (45) is conveyed by the solution pump (46) through the secondary side of the solution recuperator (43) and introduced at the head into the gas vapor enricher (42) that is combined with the first phase separator and the vapor-depleted solution (S)₁ is carried off at the bottom of the gas vapor enricher (42), passed through the primary side of the solution recuperator (43) and the solution cooler (44) and is fed again to the liquid channel of the reaction cell (40).

44. (New) Process according to claim 42 wherein the substance flows fed to and carried off from the reaction cell (50) with external load resistor (56) and connected activation source (57) are formed into an isobaric, ternary substance circuit with the external thermal substance decomposition and external phase separation by the allocation of a heated solution heater (51), a gas vapor enricher (52) that is combined with a first phase separator, a second phase separator (53), a solution pump (54) and a gas compressor (55), (Fig.5, Fig.6);

whereby the two-phase mixture (S,G,V)₂ carried off from the liquid channel of the reaction cell (50) is fed to the second phase separator (53) and the phases (S)₂ and (G,V)₂ are separated, the vapor depleted gas (G,V)₂ carried off at the head of the second phase separator (53) is — united with the stoichiometric reduced vapor-depleting gas (G,V)₁ carried off from the gas channel of the reaction cell and the mixture (G,V)_x is fed by the gas compressor (55) to the gas vapor enricher (52) and in the gas vapor enricher is conveyed towards the heated and vapor-depleting solution (S)₃ with vapor uptake and the vapor-enriched gas (G,V)₃ carried off at the head of gas vapor enricher (52) that is combined with the first phase separator is fed again to the gas channel of the reaction cell (50);